Stage Recession Rates

Expectation: Stage recession rates that typically do not exceed 1.3 feet per 30 days. If recession rates exceed this rate, less than 40% of the floodplain will be drained in 30 days.

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Relevant Endpoints:
Impact Assessment - Flood Control
Restoration - Physical Integrity - Hydrology
Restoration - Physical Integrity - Disturbance
Restoration - System Functional Integrity - Habitat Quality
Restoration - System Functional Integrity - River/Floodplain Interactions

Baseline Conditions: Baseline conditions were derived from daily average headwater stage records at S65A, S65B, S65C, S65D and S65E (Figure 1) from 1986 to 1998 and Fort Kissimmee (Figure 2) from 1984 to 1998. S65C is the downstream control for the first phase of restoration. S65D will be the downstream terminus of the complete restoration project. Fort Kissimmee is located on a remnant river section and is representative of water levels in the northern portion of the Pool B (Figure 2). Structures (except S65B) are operated to maintain a constant headwater elevation and stages in pools A, C, D, and E typically do not vary more than +/- 0.5 feet from the control elevation. Thus, baseline stage recession rates in these pools are inconsequential.

Since 1984, water levels in Pool B have been influenced by Demonstration Project weirs and seasonal stage fluctuations ranging from 39 - 42 feet at S65B. The northern area of the pool experiences temporary flooding during high discharges due to partial blockage of C-38 by the three weirs. During high discharge events, the weirs cause water levels between the upper and lower sections of the pool to differ by several feet (Figure 2) for short time periods. When high discharges decline water levels decrease rapidly, causing the floodplain in the northern portion of the pool to quickly drain into remnant river sections and C38 (Toth, 1990). Water draining off the floodplain has low dissolved oxygen levels and high BOD. The mixing of floodplain water with the already poorly oxygenated surface water has led to several fish kills.

During June 1984 - December 1998, recession rates at Fort Kissimmee ranged from 0.02 feet/day to 1.2 feet/day and had a median rate of 5.74 feet per 30 days. Forty-six out of 109 (~ 3/yr) recession events exceeded 1.3 feet per 30 days and drained more than 40 percent of the floodplain.

Reference Conditions: Reference conditions were derived from daily stage data at Fort Kissimmee and Fort Bassinger from 1942 to 1959 (Figures 3 & 4). Based on these dates, an average of one recession event occurred per year along the historic river, with peak stages typically in September or October slowly receding until May or June. Stage recession rates at Fort Kissimmee ranged from 0.01 to 0.18 feet per day and had a median rate of 0.66 feet per 30 days; the duration of recession events averaged 158 days. Five of the twenty recession events exceeded 1.3 feet per 30 days, but only two of these drained more than 40 percent of the floodplain. These two events (June 1944 and April 1951) occurred after floodplain stages had receded to low, dry season levels and a rainfall event caused stages to rise quickly, with

stages subsequently receding to previous levels at a rate greater than normal.

Stages at Fort Bassinger receded at a median rate of 0.77 feet per 30 days and ranged between 0.02 to 0.07 feet per day; durations averaged 173 days. Three of the 19 recession events at this location exceeded 1.3 feet per 30 days and two of these drained more than 40 percent of the adjacent floodplain. These two events (October 1950 and April 1951) occurred under similar conditions as described for the more rapid than normal recession events at Fort Kissimmee.

Mechanism for Achieving Expectation : A new regulation schedule and operation rules will provide a more natural flow regime to the lower Kissimmee River basin. In addition, regulation schedules and operation rules at S65D and S65C will be modified based on historic stage discharge relationships for these locations. Restoration of the physical form of the river, through backfilling C38 and carving new river segments, will direct flows through the Kissimmee River. Physical restoration and modified regulation schedules will lead to the reestablishment of a natural sloping, water surface gradient, resulting in slow stage recession rates like those of the historic system.

Adjustments for External Constraints: None

Means of Evaluation: Recession rates will be evaluated annually using daily stage data collected from a network of gauges in Pool C. Thirty-day average recession rates will be calculated by the difference in maximum and minimum stages divided by the total number of days water levels receded multiplied by 30 days. The associated proportion of floodplain drained by each recession event will be estimated from stage-area relationships for floodplain adjacent to each gauge.

Time Course: Historic stage recession rates should be initiated with the implementation of new regulation schedules, backfilling of C38, and recarving of new river sections.

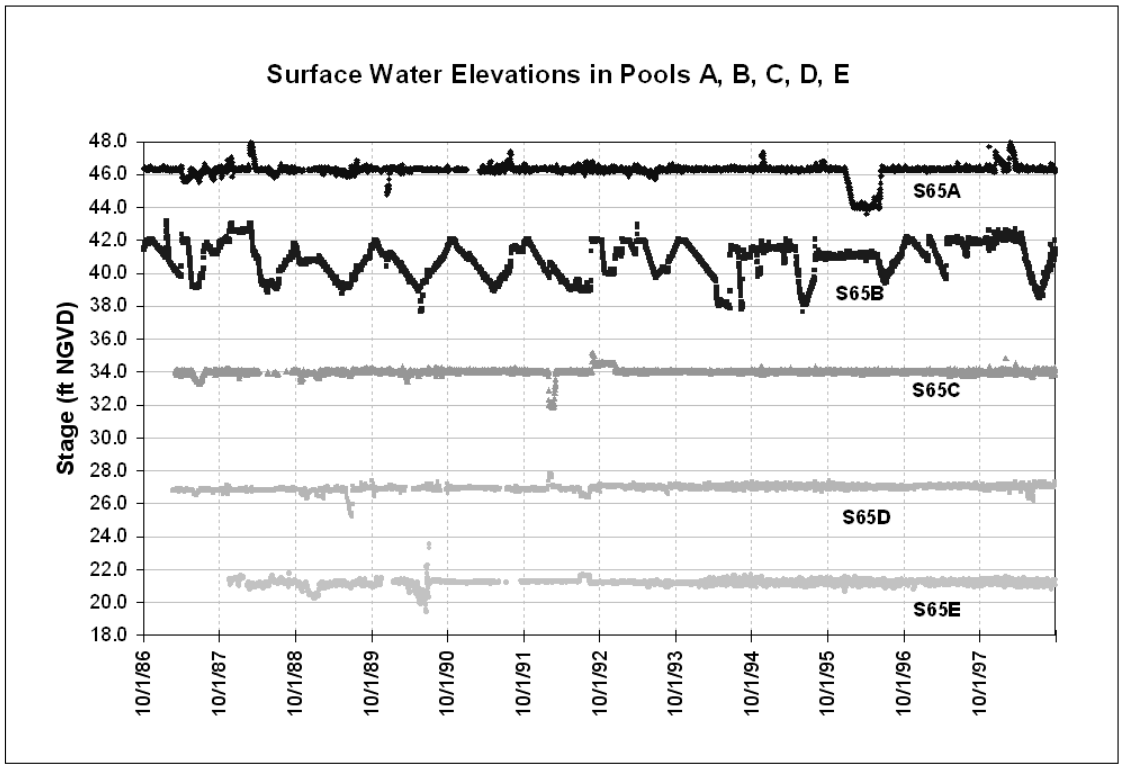

Figure 1. Daily surface water levels at structures along the C38.

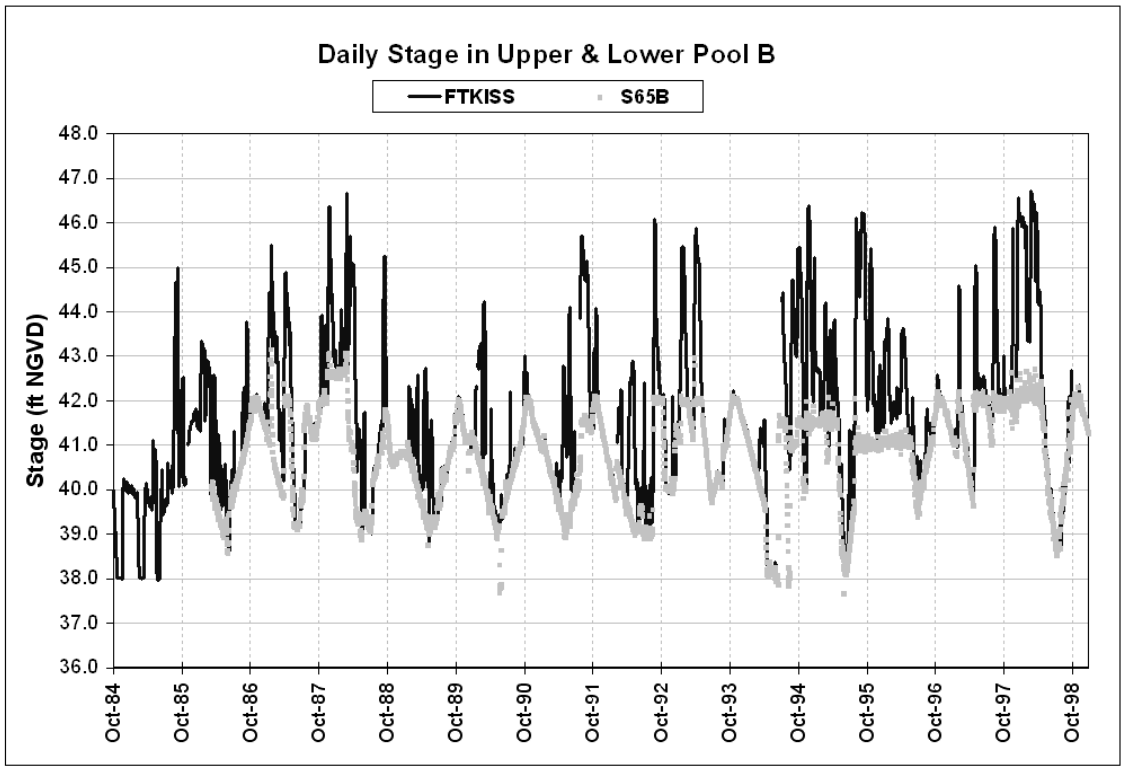

Figure 2. Daily surface water levels at Fort Kissimmee and S65B.

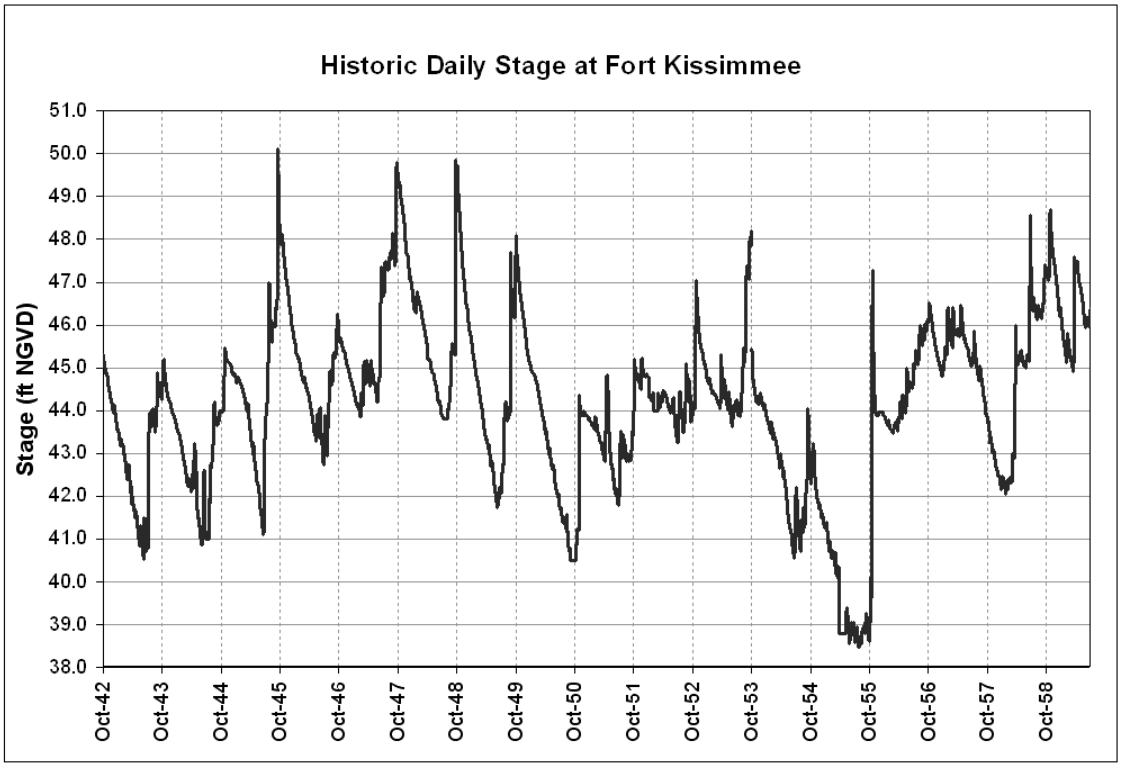

Figure 3. Historic daily surface water levels at Fort Kissimmee.

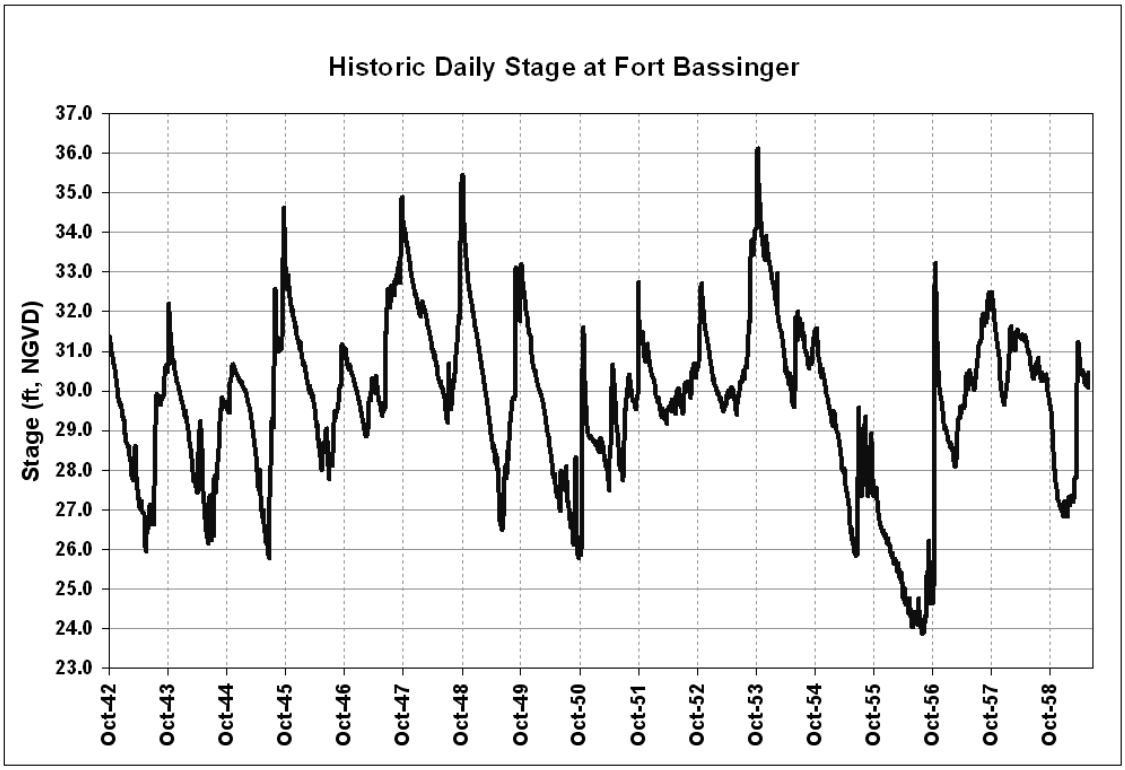

Figure 4. Historic daily surface water levels at Fort Kissimmee.